

MODEL 3558

MANUAL RESPONDER UNIT

OPERATOR MANUAL

Northeast Electronics Instruction Manual
A3558-00-600 Issue 1 December 1982

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1. GENERAL**A. Scope of Manual**

1.01 This manual describes the features of the Model 3558 Manual Responder Unit (MRU) and its use. Table A is a list of abbreviations in this manual.

1.02 Whenever this publication is reissued, the reason(s) for reissue will be listed in this paragraph.

B. Applications

1.03 The Model 3558 MRU provides a portable means of direct manual control and interrogation of several standard test lines and responders. The unit produces command signaling to set up the required testing routines. A data receiver decodes test results which are exhibited on an LED display.

1.04 The MRU is capable of performing cooperative two-way testing with the following equipment:

- Northeast Electronics Model TTS 1050 Series
- WECO Model 51B Responder (or equivalent)
- WECO Model 52A Responder (or equivalent)
- WECO Model 56A Mini-Responder (or equivalent)
- APC 1051 Test Line Responder
- AECO 105 Responder
- APC 1056A Mini-Responder

1.05 The MRU is capable of performing one-way testing with the following equipment:

- Northeast Electronics Model 3558
- Code 100 Test Line
- Code 102 Test Line
- Code 104 Test Line
- Code 107 Test Line

C. Specifications

1.06 Specifications of the Model 3558 MRU are given in Table B.

TABLE A
ABBREVIATIONS AND ACRONYMS

ABS	Acrylonitrile Butadiene Styrene (Plastic)
ALL	Step through codes 01 through 06
ASCII	American Standard Code for Information Interchange
CPS	Characters per second
CUT	Circuit under test
dB	Decibel
dBm	Ratio of power referenced to 1 milliwatt at 1000 Hz into a known impedance, measured in dB
dBm0	Ratio of power in dB referenced to some fixed TLP
dBrnC	Power in dB above a reference noise of - 90 dBm with "C" message weighting
DP	Dial pulse
ERL	Echo return loss
F → N	Far to near
GS 0.4	Gain slope at 404 Hz, - 16 dBm0
GS 1.0	Gain slope at 1004 Hz, - 16 dBm0
GS 2.8	Gain slope at 2804 Hz, - 16 dBm0
IPM	Interruptions per minute
LED	Light emitting diode
LOSS	Loss measured at 1004 Hz at 0 dBm0
MF	Multifrequency signaling (CCITT #5 compatible)
MRU	Manual Responder Unit
N → F	Near to far
NOISE	C-message (weighted) noise. Measurement of unwanted signals over a broad spectrum, measured in dBrnC
N/T	Noise with tone (C-notch) measurement
PBX	Private branch exchange
SCK	Self-check
SRH	Singing return loss, high
SRL	Singing return loss, low
MEAS/SCK	Measure/self-check
TLP	Transmission level point
TPT	Test progress tone
TT	Touch Tone® (DTMF) signaling

TABLE B
SPECIFICATIONS

Measuring Circuits Loss measurements Gain slope measurements C-message noise measurement C-notch noise measurement Type of detection Longitudinal balance	+ 2 to - 15.8 dBm $\pm$ 0.1 dB - 14 to - 36.9 dBm $\pm$ 0.1 dB @ 1 kHz - 14 to - 36.9 dBm $\pm$ 0.3 dB @ 400 Hz and 2800 Hz ($\pm$.1 dB typically) 15 to 55 dBmC $\pm$ 1.0 dB 34 to 74 dBmC $\pm$ 1.0 dB True RMS Per Bell Pub. 41009
Tone Generator Circuits Test tones Transmit levels Harmonic distortion plus noise Source and load impedance Terminal balance impedance	404, 1004, 2804 Hz - 0/+ 4 Hz 0, - 2, - 16, - 18 dBm $\pm$ 0.1 dB > 50 dB below fundamental (per Bell Pub. 41009) 600 or 900 Ω with 30 dB return loss (per Bell Pub. 41009) 600 or 900 Ω in series with 2.16 mf
Circuit (Trunk) Signaling Access number register Dial pulse speed DTMF speed and output level MF speed and output level Solid state hold circuit	15 digits 10 $\pm$ 1 PPS, 63 % $\pm$ 4 % BRK, 0.85 $\pm$ 0.05 second interdigit timing 7.3 PPS, 50 % duty, - 10 dB $\pm$ 1.0 dB per tone 6.2 digits per second, 50 % duty, - 10 dB $\pm$ 1.0 dB per tone $\geq$ 20 ma. loop current with 1700 Ω loop R and 48 V
FSK Receiver Guard tone Data tone Dynamic range	1200 Hz $\pm$ 20 Hz 2225 Hz $\pm$ 50 Hz - 3 dBm to - 28 dBm $\pm$ 1 dB

TABLE B (Cont)
SPECIFICATIONS

Optional Printer Interface Type Character format Character rate Baud rate	RS-232C ASCII 30 cps 300 baud
Electrical Input power Fuse	115 V ac $\pm$ 10 %; 12 W nominal 1/4 A, 3 AG
Environmental Temperature range Humidity	32 to 122 °F, 0 to 50 °C Up to 95 %, noncondensing
Mechanical Dimensions (H $\times$ W $\times$ D) (less mounting adaptors) Weight Mounting Circuit access Controls Displays and indicators	7.5 $\times$ 8.5 $\times$ 9.25 inches; 21.6 $\times$ 19.1 $\times$ 23.5 centimeters 8.5 pounds; 3.9 kilograms Standard 19- or 23-inch rack with appropriate adaptors 310-type jack or 5-way binding posts 12-key dialpad, clear, send, pause, cursor control, mode select, hook switch, loop start/ground start, on/off and volume, test/self-check 15 LED digits (0.3 inches high), power lamp, answer supervision lamp

2. DESCRIPTION

A. Physical Description

2.01 The Model 3558 MRU is a portable instrument weighing approximately 8.5 pounds (3.9 kg) and measuring 7.5 inches (19.1 cm) high, 8.5 inches (21.6 cm) wide, and 9.25 inches (23.5 cm) deep. The housing is fabricated of high-impact ABS material and aluminum. A locking handle is designed to also serve as a tilt stand. The handle is positioned and tightened in the selected position with two pivot-point screw caps.

B. Front Panel

2.02 The MRU front panel controls, indicators, and connectors are shown in Figure 1.

2.03 Display

2.04 The display is a 15-digit, 7-segment per digit LED display with a 0.3-inch character height. Fifth and tenth digit markers are located on the display filter for separation of test codes and measurement displays. The display is used in three modes which are described in Table C.

2.05 Controls and Indicators

2.06 MRU controls and indicators are described in Table D.

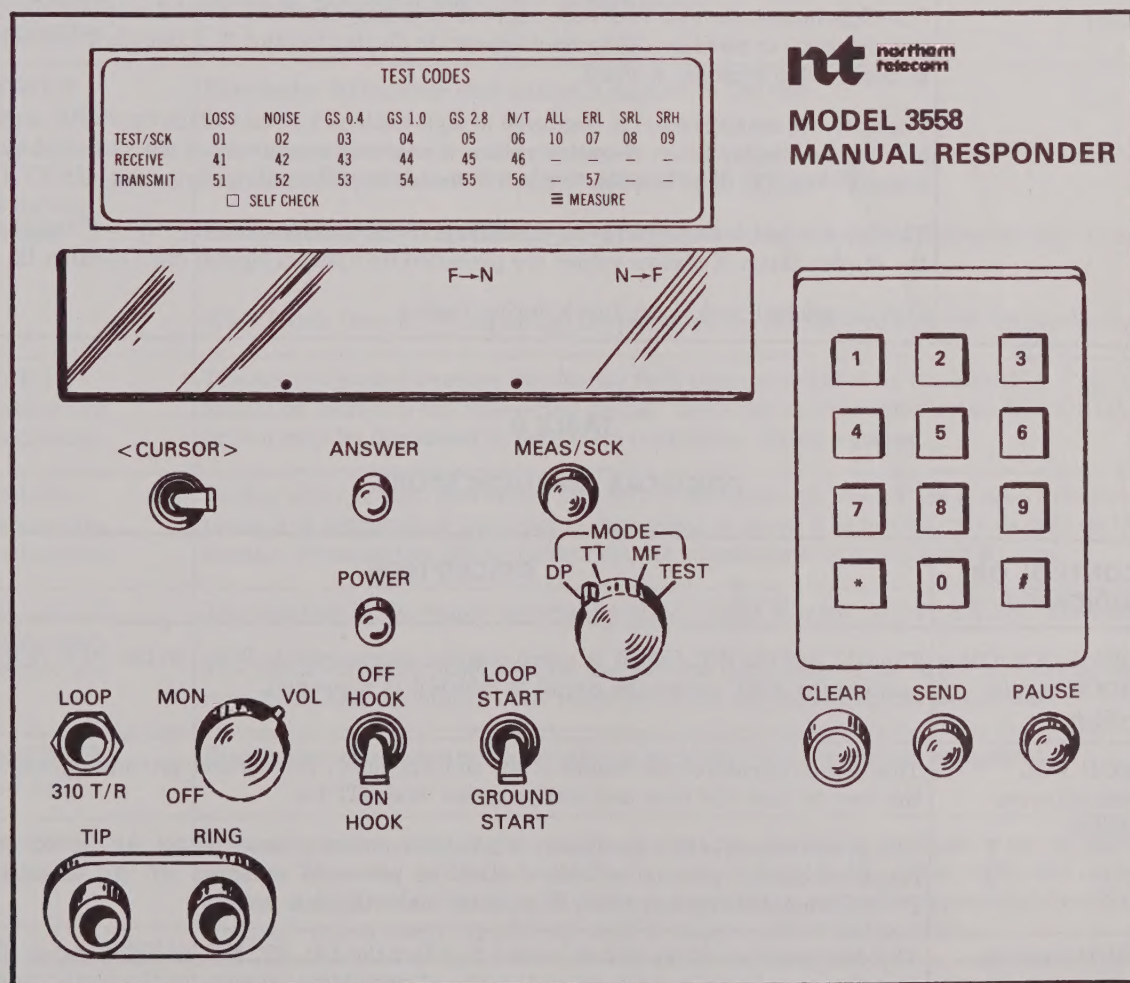


Fig. 1—Front Panel

B0146-00

TABLE C
DISPLAY MODES

MODE	DESCRIPTION
POWER ON SELF-TEST	When the instrument is initially powered up, a routine check of the microprocessor circuitry within the instrument is performed. Satisfactory completion of this step results in a "PASS" indication on the first four digit locations of the display field. (For ease of character reference, the display field digits are numbered one through fifteen from left to right.) "PASS" displays for five seconds and is then automatically extinguished. At this point the instrument is ready to use.
ACCESS NUMBER	The far-end access number entered into the memory of the MRU is displayed for verification and editing. Pauses in the outpulsing sequence are indicated by a dash (-) on the display.
TEST	One-digit impedance and TLP codes appear in display locations 1 and 2 respectively. A self-check (□) or measure (≡) symbol appears in display location 3. A two-digit test code is displayed in locations 4 and 5. The near-end measurement is displayed in digit locations 8, 9, and 10 under the "F → N" label on the display filter. Negative values of near-end measurement are preceded by a minus (-) sign in digit location 7; positive measurement readings are unsigned. The far-end data is displayed in digit locations 13, 14, and 15 under the "N → F" label on the display filter. Negative values are preceded by a minus sign in digit location 12. Digit locations 6 and 11 are blank during testing.

TABLE D
CONTROLS AND INDICATORS

CONTROL OR INDICATOR	DESCRIPTION
OFF HOOK/ON HOOK toggle switch	The ON HOOK/OFF HOOK is a two-position toggle switch. When in the OFF HOOK position the MRU seizes the circuit to which it is connected.
MON VOL control/power switch	This is used to control the volume of the audio monitor. The monitor provides means for the user to hear dial tone and test progress tones (TPTs). The power switch is also incorporated into the monitor volume control. At the extreme counterclockwise position of this control, ac power is switched off. An associated POWER indicator (green LED) illuminates when the unit is on.
MODE rotary switch	This four-position rotary switch is used to select the DP, TT, MF, or TEST mode. The first three modes are used to select the type of signaling necessary for the particular circuit under test (CUT). One of these three modes must be used when outpulsing the access number.

TABLE D (Cont)
CONTROLS AND INDICATORS

CONTROL OR INDICATOR	DESCRIPTION
MODE rotary switch (Cont)	After the CUT has completed to the far-end test line or responder, the TEST mode is used during all test procedures.
LOOP START/ GROUND START toggle switch	In the LOOP START position, when the MRU goes off hook a loop current path is established. In GROUND START position, when the MRU goes off hook it applies ground to the ring lead of the CUT. After a one-half second delay, the MRU enables the loop current path and releases the ring ground.
SEND momentary pushbutton	Pressing this button initiates outpulsing of test code or access number information shown on the Model 3558 MRU display field.
POWER green LED	Illuminates to indicate that power is applied to the unit.
KEYPAD 12-button keypad	The keypad is used to enter access numbers and test codes. The asterisk (*) key functions as a character erase key to delete a character after it has been entered. With Touch Tone (TT) [®] signaling, the pound (#) key is indicated by a "P" on the display.
CLEAR momentary pushbutton	This button is used to erase the display field register selected by the MODE switch. Information stored in the unselected display memories remains unaffected. The CLEAR button may be depressed to terminate outpulsing during a pause.
PAUSE momentary pushbutton	During entry of data into either DP, TT, or MF memory, this button is used to insert a pause in a sequence of digits being outpulsed. A pause is indicated by a dash (-) on the display. Pressing the SEND button causes outpulsing to resume after a pause.
MEAS/SCK momentary pushbutton	The pushbutton alternately selects the SELF-CHECK mode and the MEASURE mode. The SELF-CHECK mode verifies the internal calibration of the MRU and the far-end responder, and the MEASURE mode performs the indicated test on the CUT.
ANSWER red LED	Illuminates when answer supervision is received from the far-end equipment.
CURSOR toggle	This two-position spring return toggle controls the position of the flashing cursor on the display. When the switch is momentarily moved either to the left or right, the cursor steps one digit in that direction. If the switch is held in position for approximately one second, the cursor steps repetitively until it reaches either end position.

SECTION 1

Circuit Connections

2.07 Circuit connections are made to a 310-type jack or to the two five-way binding posts mounted on the front panel. (See Figure 1.)

C. Power

2.08 The MRU is powered from a 115-V ac source. The power switch is incorporated into the

MON VOL control located on the front panel. A green POWER lamp illuminates when the power is on. (See Figure 1.) A protective 1/4-amp, 3 AG slo-blo fuse receptacle is located on the rear panel. A removable six-foot, three-conductor power cord (Belden-type 17745, or equivalent) is plugged into the rear panel connector. Figure 2 shows the location of the fuse and the power cord on the rear panel.

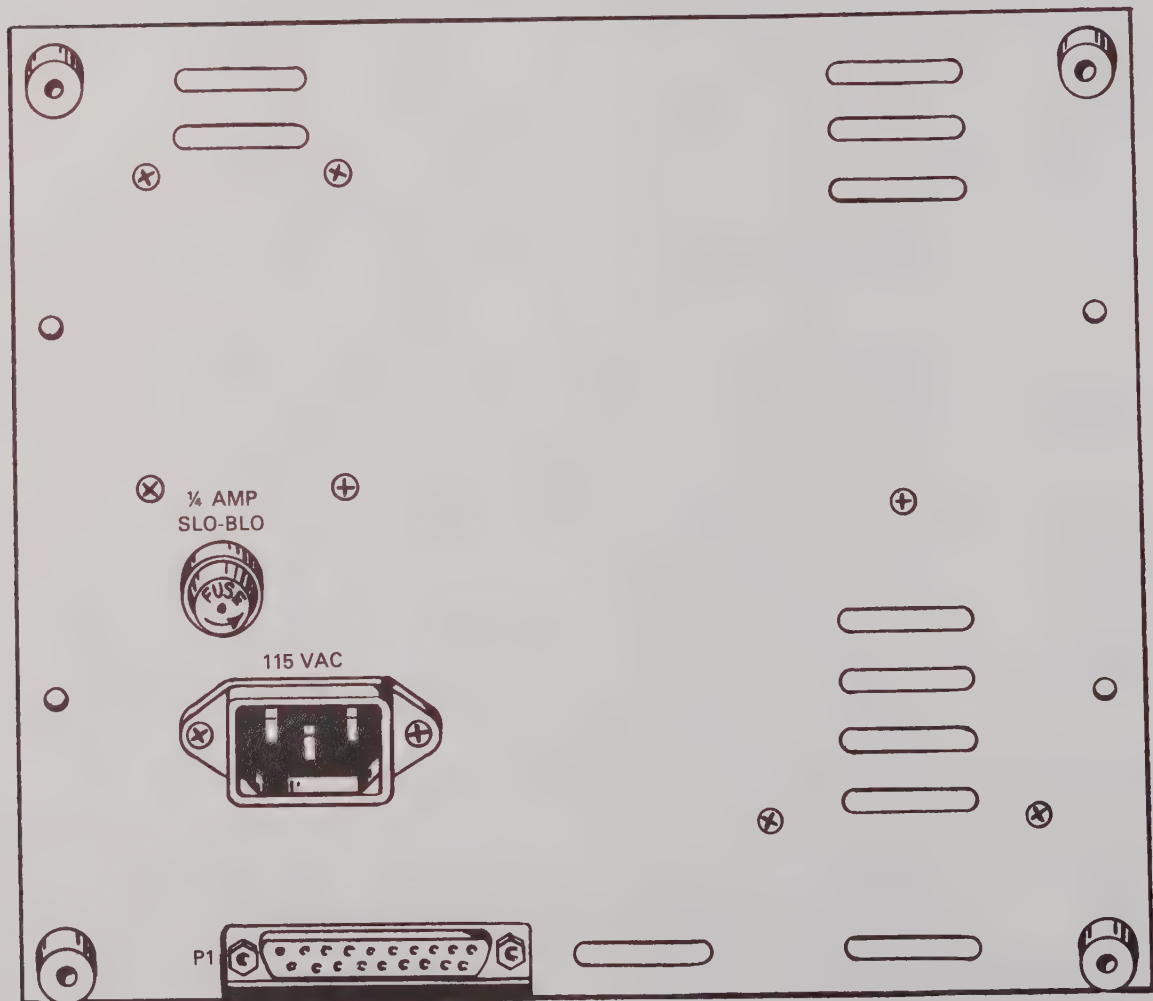


Fig. 2—Back Panel

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D. Options**2.09 Printer Interface**

2.10 The Model 3558 MRU can be optionally configured to connect to a customer-supplied printer via an RS-232C interface. Table E shows the EIA and FSK model numbers. The MRU uses a 30-cps (300 baud) character rate and ASCII format. A character is made up of a start bit (always "0" or space), seven data bits (least significant bit first), a parity bit, and one stop bit (always "1" or mark). Figure 3 illustrates the character serial data bit timing.

2.11 The 25-pin RS-232C connector (P1) is mounted on the Model 3558 MRU back panel. The pin callouts for the printer interface are described in Table F. Figure 2 shows the location of P1 on the back panel.

TABLE E
MODEL NUMBERS

Non-EIA MRU EIA MRU	Model 3558A-1 Model 3558A-2
------------------------	--------------------------------

2.12 Figure 4 shows a sample printout from the MRU using a Texas Instruments Silent 700 Printer.

2.13 Carrying Case

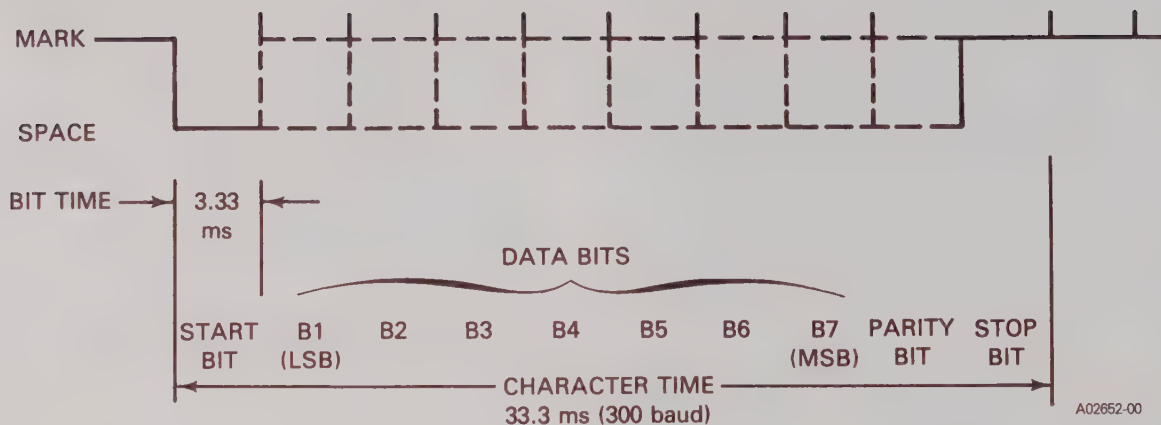
2.14 A fiberglass carrying case with preformed foam liner is available for carrying the MRU and necessary accessories.

2.15 Rack Mounting

2.16 Mounting ears to install the MRU in a standard 19- or 23-inch equipment rack are also available.

TABLE F
RS-232C CONNECTOR PIN CALLOUTS

PIN NUMBER	CIRCUIT	DESCRIPTION
1	AA	Protective ground
2	BA	Receive data
3	BB	Transmit data
4	CA	Request to send
5	CB	Clear to send
6	CC	Data set ready
7	AB	Signal ground (common return)
8	CF	Carrier detect
20	CD	Data terminal ready



A02652-00

Fig. 3—Serial Data Timing Diagram

NORTHEAST ELECTRONICS
MODEL 3558 MRU

OFF HOOK

FAR END NUMBER 5730037

LOSS MEASURE (DBM)

F-N	N-F
- 8.9	- 8.5

IDLE NOISE MEASURE (DBRNC)

F-N	N-F
18	20

GAIN SLOPE 404HZ MEASURE (DBM)

F-N	N-F
-25.9	-25.1

GAIN SLOPE 1004HZ MEASURE (DBM)

F-N	N-F
-24.6	-24.0

GAIN SLOPE 2804HZ MEASURE (DBM)

F-N	N-F
-31.2	-30.4

NOISE/TONE MEASURE (DBRNC)

F-N	N-F
39	34

TERMINAL BALANCE ERL MEASURE (DB)

F-N	N-F
	10

TERMINAL BALANCE SRL MEASURE (DB)

F-N	N-F
	13

TERMINAL BALANCE SRLN MEASURE (DB)

F-N	N-F
	5

ON HOOK

A02652-01

Fig. 4—Sample Printout Using Texas Instruments Silent 700 Printer

3. OPERATION

A. Start-up Procedure

3.01 Start the Model 3558 MRU as follows:

- (1) Connect the power cord to a 120-V ac power source.

Caution: *Do not defeat the third-wire ground. Failure to heed this warning may result in equipment damage and shock hazard.*

- (2) Put the unit in the ON HOOK position using the ON HOOK/OFF HOOK toggle switch on the unit front panel.
- (3) Apply power to the unit by turning the MON VOL control clockwise from the OFF position. The POWER indicator (a green LED) will illuminate, and the word "PASS" will appear for about five seconds in the display on the front panel.

Note: If the POWER indicator fails to illuminate, check the power cord for proper connection and check to see if the fuse has blown. If the POWER indicator illuminates and the word "PASS" fails to appear in the front panel display, the internal program is not working and the unit needs service. (See Part 4.)

- (4) Select loop start or ground start operation using the LOOP START/GROUND START switch.
- (5) Connect the unit to the circuit to be tested using the jacks or binding posts found on the front panel of the unit.

3.02 If the MRU is to be connected to a printer for recording of test and self-check results, use a 25-pin plug to connect the printer to the unit. Figure 2 shows the location of the 25-pin connector (P1) on the back panel and Table F shows the RS-232C connector pin callouts.

Caution: *Make sure that the printer interface uses the same pin callouts as the MRU. Failure to perform this check may result in equipment damage or malfunction.*

B. Far-End Access and Test Initiation

3.03 Access the far-end responder by performing the following steps:

(1) Enter the far-end number as follows:

- (a) Using the MODE rotary switch, select the proper signaling mode: DP for dial pulse, TT for Touch Tone (TT)[®], or MF for multifrequency (CCITT #5 compatible).
- (b) Enter the access number (15 digits maximum) using the 12-button keypad and the PAUSE pushbutton. Note that a pause is indicated by a dash (-) on the display and that a pound sign (#) is indicated by a "P" on the display.
- (c) Make sure that the access number is correct and edit it if necessary as follows:
 - (i) Using the CURSOR toggle switch, position the cursor to the right of the character to be changed.
 - (ii) Enter the correct character. The cursor will advance to the next character.
 - (iii) Or press the asterisk (*) key to erase the character.

(2) Enter the test codes as follows:

- (a) Select the TEST mode using the MODE switch. (When the TEST mode is selected, the labels F → N and N → F will be illuminated in the center and at the right of the display, respectively.)
- (b) Enter the proper impedance code for the CUT in display position one using the keypad: "6" for 600-ohm or "9" for 900-ohm terminations.
- (c) Enter the proper TLP code in display position two using the keypad: "0" for 0 dBm or "2" for - 2 dBm TLP.
- (d) Use the MEAS/SCK pushbutton to select the desired code: measure "≡", or self-check "□". This code is displayed in the third display position.

- (e) Enter the desired two-digit test code in display positions four and five. The two-digit test codes are shown on the front panel of the MRU and in Tables G and H.

Example: The following display shows test codes for a 900-ohm circuit impedance, 0 dBm TLP, and measuring for loss (at 1004 Hz).



- (f) Make sure that the test code is correct and edit it if necessary as follows:
 - (i) Using the CURSOR toggle switch, position the cursor to the right of the character to be changed.
 - (ii) Enter the correct character. The cursor will advance to the next character.
 - (iii) Or press the asterisk (*) key to erase the character.
- (3) Transmit the stored far-end access code and test code as follows:
 - (a) Put the unit off hook using the ON HOOK/OFF HOOK switch on the front panel. If the CUT is equipped for answer supervision, the ANSWER light will illuminate when answer is received.
 - (b) Select the proper signaling mode (DP, TT, or MF) using the MODE switch.
 - (c) Press the SEND button to outpulse the stored digits. If there are any pauses in the outpulsing sequence (to accommodate access via Centrex, PBX, etc.), depress the SEND button to resume the outpulsing sequence, or depress the CLEAR button to terminate the outpulsing sequence.

Note: When the digits have been outpulsed, the far-end test line sends one of two audible responses: a 2225-Hz test progress tone (TPT) indicating that the far-end test line is connected, or a 60-IPM tone indicating that the test line is busy. When the TPT is received, the MRU is connected and testing may proceed.

- (d) Select the TEST mode using the MODE switch.
- (e) Press the SEND button to transmit the test commands.

3.04 When the SEND button is depressed, one of two series of events occur:

- The test commands are transmitted as evidenced by a series of MF tone pairs heard through the MRU audio monitor. After the test commands are sent, a measurement signal and data are received by the MRU and presented in the appropriate areas on the display field.
- Or, the word “Error” appears on the display. This indicates that the test code is incorrect. Edit the test code as shown in the previous procedure and retransmit the test commands using the SEND button.

C. Additional Testing

3.05 After a test command is transmitted, the cursor remains at the second test code digit (character 5). This facilitates keypad entry to modify the second digit of the test code for other tests. This feature may be bypassed by selecting the test ALL code (see Table G). The test ALL code is used to sequentially perform the loss, noise, noise with tone, and gain slope tests. The MRU steps to the next test in the sequence automatically.

3.06 The MRU repeats the current test command automatically at approximately 14-second intervals. This prevents the far end from timing out. The automatic repetition of the test commands can be terminated by depressing the CLEAR button, sending another test command, or by switching the MODE switch out of the TEST position.

3.07 Enter the test codes and continue the testing as follows:

- (1) Use the MEAS/SCK pushbutton to select the desired code: measure “≡”, or self-check “□”. This code is displayed in the third display position.
- (2) Enter the desired two-digit test code in display positions four and five. The two-digit test codes are shown on the front panel of the MRU and in Tables G and H.

Example: The following display shows tone generating codes for a 600-0hm termination, - 2 dBm TLP gain slope measurement at 404 Hz.

62 $\equiv$ 53.....

- (3) Make sure that the test code is correct and edit it if necessary as follows:
 - (a) Using the CURSOR toggle switch, position the cursor to the right of the character to be changed.
 - (b) Enter the correct character. The cursor will advance to the next character.

(c) Or press the asterisk (*) key to erase the character.

- (4) Press the SEND button to transmit the appropriate test commands.

D. Test Codes

3.08 There are two classes of far-end equipment with which the MRU can communicate. The first comprises test lines and responders. The associated test codes are shown in Table G. The second class is made up of measuring instruments such as transmission test sets, ERL test sets, and other Model 3558 MRUs that use terminations and tones provided by the MRU. The test codes for this class of instrument are shown in Table H. The test codes for both classes of far-end equipment are also shown on the front panel of the MRU.

TABLE G
TEST CODES

TEST LINES AND RESPONDERS	MODE	LOSS	NOISE	GS 0.4	GS 1.0	GS 2.8	N/T	ALL	ERL	SRL	SRH
105-type	TEST/SCK	01	02	03	04	05	06	10	07	08	09
NED 3558	RECEIVE TRANSMIT	41 51	42 52	43 53	44 54	45 55	46 56	— —	— 57	— —	— —
107-type	RECEIVE	41	42	43	44	45	46	—	—	—	—
100-, 102-type	RECEIVE	41	42	—	—	—	—	—	—	—	—
104-type	RECEIVE TRANSMIT	41 51	42 —	— —	— —	— —	— —	— —	— —	— —	— —

TABLE H
TERMINATION AND TEST CODES

TERMINATION/TRANSMISSION	TEST CODE
1004 Hz, 0 dBm0 (loss)	51
Quiet Termination (noise)	52
404 Hz, - 16 dBm0 (gain slope)	53
1004 Hz, - 16 dBm0 (gain slope)	54
2804 Hz, - 16 dBm0 (gain slope)	55
1004 Hz, - 16 dBm0 (C-notch)	56
Quiet Termination (ERL)	57

E. Data Output

3.09 Data Display

3.10 The display areas for near-to-far and the far-to-near are under the illuminated "N → F" and "F → N" labels on the display filter. In the case of

two-way measurements, both the near-to-far and the far-to-near results appear on the display. When one-way measurements are made, the results appear beneath the appropriate label.

3.11 Negative Results

3.12 The results of measurements which have a negative value are displayed with a minus sign preceding the value. Positive values are displayed without a sign.

3.13 Measured Data Beyond Limits

3.14 Measured data is displayed as just described unless it exceeds the range limits normally associated with the measurement. An "H" (for high) or an "L" (for low) is displayed in the appropriate location to designate which limit has been exceeded. Table J shows the range limits programmed into the MRU.

3.15 Self-Check Output

3.16 In addition to the measurement tests, a set of self-check instructions is included to permit the user to verify the calibration of internal and responder measuring devices. When these codes are used, the display will indicate any deviation error in the responder measuring circuits. Self-check measurements that are out of the acceptable range are displayed as flashing digits.

TABLE J
DATA RANGE LIMITS

MEASUREMENT	TEST CODE	LOW LIMIT	HIGH LIMIT
Loss (1004 Hz, 0 dBm0)	01,41	- 16 dBm	+ 2 dBm
Noise (quiet termination)	02,42	14 dBmC	56 dBmC
Gain slope (404 Hz, - 16 dBm0)	03,43	- 37 dBm	- 14 dBm
Gain slope (1004 Hz, - 16 dBm0)	04,44	- 37 dBm	- 14 dBm
Gain slope (2804 Hz, - 16 dBm0)	05,45	- 37 dBm	- 14 dBm
C-notch (1004 Hz, - 16 dBm0)	06,46	33 dBmC	75 dBmC
ERL (quiet termination)	07	40 dB	0 dB
SRH (quiet termination)	08	40 dB	0 dB
SRL (quiet termination)	09	40 dB	0 dB

4. MAINTENANCE**A. General**

4.01 The Model 3558 MRU uses microprocessor control for all its functions. All signaling frequencies, timing intervals, and display decoding are precisely controlled by a common crystal time base. No field calibration is recommended for the unit.

4.02 Field repairs of the MRU are not recommended. For technical assistance, contact the Repair Department at Northern Telecom Inc., Northeast Electronics Division at (603) 224-6511.

B. Initial Inspection

4.03 The signaling display is carefully inspected, both mechanically and electrically before shipment. It should be working properly when received. If damage from transit is found, notify the transportation carrier immediately.

C. Service Information

4.04 Complete warranty information is contained in the purchase order agreement under terms and conditions of sale. Summarized briefly, the Northeast Electronics warranty extends for a period of one year to the original purchaser of a Northeast test instrument. Northeast's system products are covered by a special warranty which can be summarized as follows:

- ☐ Hardware items are warranted for a period of 90 days.
- ☐ Software is warranted for a period of one year.

4.05 It is recommended that Northeast's Repair Department be contacted for assistance if, for any reason, a Northeast product fails to perform as expected. This step eliminates the needless delay entailed when a product is returned unnecessarily. Contact the Repair Department at Northern Telecom Inc., Northeast Electronics Division, P.O. Box 649, Concord, New Hampshire 03301, telephone: (603) ~~224-6511~~. (603) 228-3700

4.06 If a Northeast Electronics product requires factory servicing *during* the warranty period, be sure to include a ship-to address and a description of the problem when returning the product to Northeast Electronics.

After the warranty period has expired, equipment returned must be accompanied by all of the following:

- ☐ The number of the purchase order covering the cost of servicing,
- ☐ Bill-to address,
- ☐ Ship-to address, and
- ☐ Description of problem.

4.07 In all cases, Northeast Electronics products should be returned directly to our Factory Service Center in Concord, New Hampshire for repair. Any material requiring repair must be returned to Northeast via a Return Material Authorization (RMA) Number, which will be assigned by the Service Center Order Processing Administrator. Customers may call the Factory Service Center at 1-603-224-6511, extension 2257 for the assignment of the number.

603 224-6511

Ext. 2202 - Gene Driscoll
Repair



PRINTED IN U.S.A.

Northern Telecom Inc.

Test Systems Division
Northeast Electronics
P.O. Box 649
Concord, New Hampshire 03301

Tel. (603) 224-6511
TWX 710-361-1886
Telex 94-3453